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Research Article

Mites of the genus *Bryobia* (Acari, Tetranychidae): taxonomic notes on some species and a diagnostic key to the world species

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Abstract

The present study aimed to develop taxonomic keys to the world species of the genus *Bryobia*, categorized into three subgenera: *Allobia* Livschits & Mitrofanov, *Bryobia* s. str. Koch, and *Lyobia* Livschits & Mitrofanov. Published descriptions, redescriptions, and illustrations of a total of 149 world species were thoroughly analyzed. The taxonomic notes on the status of the species in the species groups of each subgenus are discussed in detail. The variability of morphological characters found among different populations of a species is discussed. As a result, 116 species of the genus *Bryobia* were classified in three diagnostic keys, with 22, 43, and 51 species assigned to the three subgenera *Allobia*, *Bryobia*, and *Lyobia*, respectively. The population of *B. neoribis* Tuttle & Baker from Utah, USA, should be re-identified through type examination due to differences from the original description of the species. Additionally, taxonomic notes are provided on the status of the remaining 33 species, and arguments are provided on suggested synonyms among them.

Key words: *Allobia*, *Lyobia*, *neoribis*, *praetiosa*, species groups, subgenera

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Introduction

The genus *Bryobia* Koch, 1836, is the largest in the subfamily Bryobiinae (Pritchard and Baker 1955) and comprises 149 described species reported globally (Migeon and Dorkeld 2025). These mites are phytophagous and include some of the most notorious pests (Jeppson et al. 1975). The clover mite, *B. praetiosa* Koch, 1836, is a famous member of the genus, infesting different economic fruit, grain, and ornamental crops, and is distributed worldwide (Jeppson et al. 1975).

Historically, *Bryobia* species were once divided into seven species groups based on the presence of a row of stout setae on leg femur I (Eyndhoven 1956). Livschits and Mitrofanov (1971) introduced a comprehensive analysis of the genus, provided new species synonymies, and, based on the combination of eight morphological characters, proposed five subgenera in the genus, while the sixth subgenus was added by Mitrofanov (1973). Recently, Mirza et al. (2024) comprehensively re-evaluated those morphological characters for generic differentiation and proposed three subgenera in the genus *Bryobia*: *Bryobia* Koch s. str., *Allobia* Livschits & Mitrofanov, and *Lyobia* Livschits & Mitrofanov. These subgenera were diagnosed

based on the presence or absence of duplex setae (tactile seta with a sensory solenidion) on leg tarsi III and IV (Fig. 1a, b). Additionally, the species of each subgenus were categorized into three species groups based on the position of the inner sacral setae f_1 (Mirza et al. 2024). A total of eight species described by Meyer (1974, 1987), which possess pad-like true claws on leg I, were also discussed over the contradiction with the diagnosis of the tribe Bryobiini (Mirza et al. 2024).

There are various morphological characters that have been misinterpreted (e.g., the position of inner and outer sacrals), while others have been mistakenly considered as differences to distinguish species, rather than as intraspecific variations (i.e., body length, length of propodosomal lobes, number of setae on leg segments, length of leg segments). This raised the issue of species complexes, and the perfect example is the *praetiosa* species complex (Pritchard and Baker 1955). Different regional keys have been published over time from around the world, including those from Africa, Asia, the USSR, the USA, and Europe (Meyer 1974, 1987, 1992; Eyndhoven and Vacante 1985; Livschits and Mitrofanov 1971; Ehara 1999; Auger et al. 2015; Çobanoğlu et al. 2021; Stathakis et al. 2022). However, in the absence of a world key to *Bryobia* species, it would be difficult to grasp the true species identity. This study, based entirely on published literature, aims to distinguish true morphological differences from intraspecific variations to validate species statuses, develop taxonomic keys for the world's *Bryobia* species within the three subgenera proposed by Mirza et al. (2024), and provide taxonomic notes on the status of certain species.

Materials and methods

The published morpho-taxonomic literature of 149 world species of the genus *Bryobia* was collected using the websites of different research journals and spider mite web databases (Migeon and Dorkeld 2006–2025). All the published literature related to the taxonomy and systematics of the *Bryobia* species were equally considered. The classification proposed by Mirza et al. (2024) is followed for the subgenera and species groups. The species descriptions, redescriptions, illustrations, taxonomic revisions, and regionally prepared identification keys were critically investigated to develop three dichotomous keys for the three subgenera of the genus *Bryobia* to identify the species.

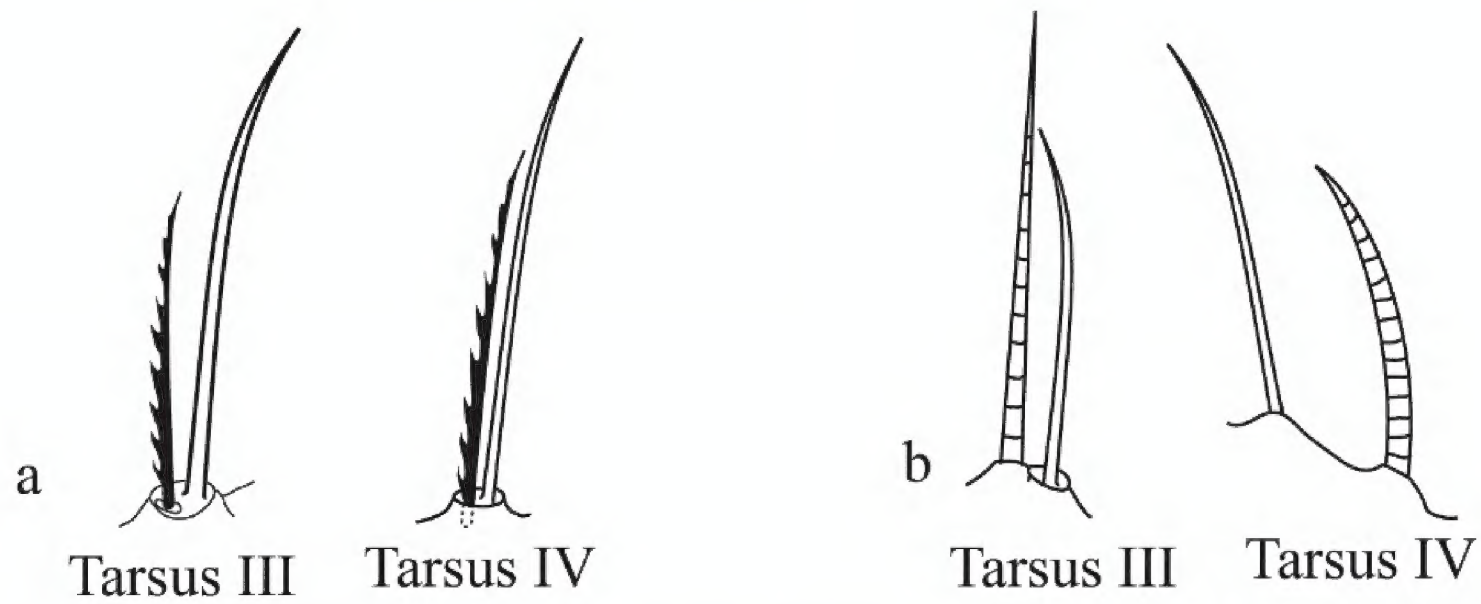

Figure 1. Duplex setae on leg tarsi III and IV **a** duplex setae present on both leg tarsi III-IV in *Bryobia* (*Bryobia*) *praetiosa* Koch, 1836 (redrawn from Livschits and Mitrofanov 1971) **b** duplex setae absent on leg tarsus III in *Bryobia* (*Lyobia*) *rubrioculus* (Scheuten, 1857) (redrawn from Vacante 1983).

Results and discussion

Family Tetranychidae Donnadieu
Subfamily Bryobiinae Berlese

Tribe Bryobiini Reck

Diagnosis. True claws uncinate and empodium pad-like.

Genus *Bryobia* Koch, 1836

Type species. *Bryobia praetiosa* Koch, 1836: 8.

Diagnosis (based on females). As defined by Arabuli et al. (2019) and Mirza et al. (2024).

There are four species, *B. apsheronica* Khalilova, 1953, *B. desertorum* Hassan, Afifi & Nawar, 1986, *B. ribis* Thomas, 1896, and *B. weyerensis* Packard, 1889, not included in any subgenus or species group due to inadequate and insufficient literature, as also reported by Mirza et al. (2024). In the very brief descriptive statements of *B. weyerensis*, the original author provided the two completely different generic names to which this species may belong, "*Bryiobia* ? (or *Penthaleus*)" (Packard 1889). The former three species require re-description based on type examination to be added to the respective subgenus and species group.

Subgenus *Allobia* Livschits & Mitrofanov, 1971

Type species. *Bryobia pritchardi* Rimando, 1962: 9.

Diagnosis (based on females). As defined by Mirza et al. (2024).

Key to the 22 species of the subgenus *Allobia*

Species groups definition is based on Mirza et al. 2024.

1 Dorsocentral setae f_1 present centrally, aligned with other dorsocentral setae, the distance f_1-f_1 is always shorter than f_2-f_2 (Fig. 2a) *abbatielloi* species group **3**
– Dorsocentral setae f_1 present laterally or sub laterally **2**
2 Dorsocentral setae f_1 present laterally along the margin and the distance f_1-f_1 is always greater than f_2-f_2 (Fig. 2b) *pritchardi* species group..... **4**
– Dorsocentral setae f_1 present sub laterally, neither aligned with other dorsocentral setae nor present marginally, and the distance f_1-f_1 could be shorter or longer than f_2-f_2 (Fig. 2c) *deserticola* species group..... **21**
3 Propodosoma with distinct, 4 well-developed lobes (Fig. 3a)..... ..... ***B.* (*A.*) *querci* Hatzinikolis & Panou, 1997**
– Propodosomal lobes absent (Fig. 3b)..... ..... ***B.* (*A.*) *abbatielloi* (Smiley & Baker, 1995)**
4 Empodium I with 1 pair of tenent hairs (Fig. 4a) **5**
– Empodium I with > 1 pairs of tenent hairs (Fig. 4b) **16**

5 Genu I with ≤ 6setae **6**
– Genu I with 7 or 8 setae **9**
6 Genu I with 6 setae; femur I with 9 setae ..... ***B.* (*A.*) *beaufortensis* Meyer, 1992**
– Genu I with 4 or 5 setae **7**
7 Propodosomal lobes well developed; peritremes ending in an enlarge anastomose (Fig. 5a) ..... ***B.* (*A.*) *marcandrei* Hatzinikolis & Panou, 1996**
– Propodosomal lobes weakly developed **8**
8 Peritremes ending in simple bulb (Fig. 5b); genu I with 5 setae ..... ***B.* (*A.*) *ylikiensis* (Hatzinikolis & Emmanouel, 1993)**
– Peritremes ending in an ovate anastomosis; genu I with 4 setae ..... ***B.* (*A.*) *giannitsensis* Hatzinikolis & Panou, 1996**
9 Median propodosomal lobes well developed; femur III with 3 setae..... ***B.* (*A.*) *relhaniae* Meyer, 1992**
– Median propodosomal lobes weakly developed or fused into a single lobe (Fig. 3c, d) **10**
10 Femur II with ≥ 11 setae..... **11**
– Femur II with 8–10 setae **13**
11 Propodosoma with 8 setae..... **12**
– Propodosoma with 7 setae; peritremes anastomosed..... ***B.* (*A.*) *aegyptiacus* (Zaher, Gomaa & El-Enany, 1982)**
12 Peritremes terminate in simple bulb ..... ***B.* (*A.*) *nigromontana* Meyer, 1992**
– Peritremes terminate in a chamber consisting of a few lobes; stylophore with deep depression ..... ***B.* (*A.*) *geyeri* Meyer, 1974**
13 Femur II with 9 setae..... ***B.* (*A.*) *caricae* Hatzinikolis & Emmanouel, 1991**
– Femur II with 8 setae..... **14**
14 Tibia III with 7 setae ..... ***B.* (*A.*) *macedonica* Hatzinikolis & Panou, 1996**
– Tibia III with 9 setae **15**
15 Tarsus III without solenidion, peritremes elongate anastomose ..... ***B.* (*A.*) *pritchardi* Rimando, 1962**
– Tarsus III with a solenidion, peritremes simple ..... ***B.* (*A.*) *meyerae* Zaher, Gomaa & El-Enany, 1982**
16 Propodosoma with incomplete reticulation medially; peritremes end in simple bulb ..... ***B.* (*A.*) *angolensis* Meyer, 1987**
– Propodosoma without reticulation..... **17**
17 Peritremes end in small anastomosis **18**
– Peritremes end in simple bulb..... **20**
18 Median propodosomal lobes fused into a single lobe..... **19**
– Median propodosomal lobes well incised and developed; palp tarsus with 7 setae..... ***B.* (*A.*) *imbricata* Meyer, 1974**
19 Palp tarsus with 6 setae..... ***B.* (*A.*) *monechmae* Meyer, 1974**
– Palp tarsus with 7 setae..... ***B.* (*A.*) *tuberosa* Meyer, 1974**
20 Femur I with 7 setae; stylophore deeply incised ..... ***B.* (*A.*) *coatesi* Meyer, 1974**
– Femur I with > 7 setae; stylophore rounded..... ***B.* (*A.*) *incana* Meyer, 1992**
21 Empodium I with a pair of tenant hairs; peritremes ending in a small anastomosis ..... ***B.* (*A.*) *deserticola* Meyer, 1989**
– Empodium I with 2 pairs of tenant hairs; peritremes ending in a simple bulb..... ***B.* (*A.*) *birivularis* Meyer, 1989**

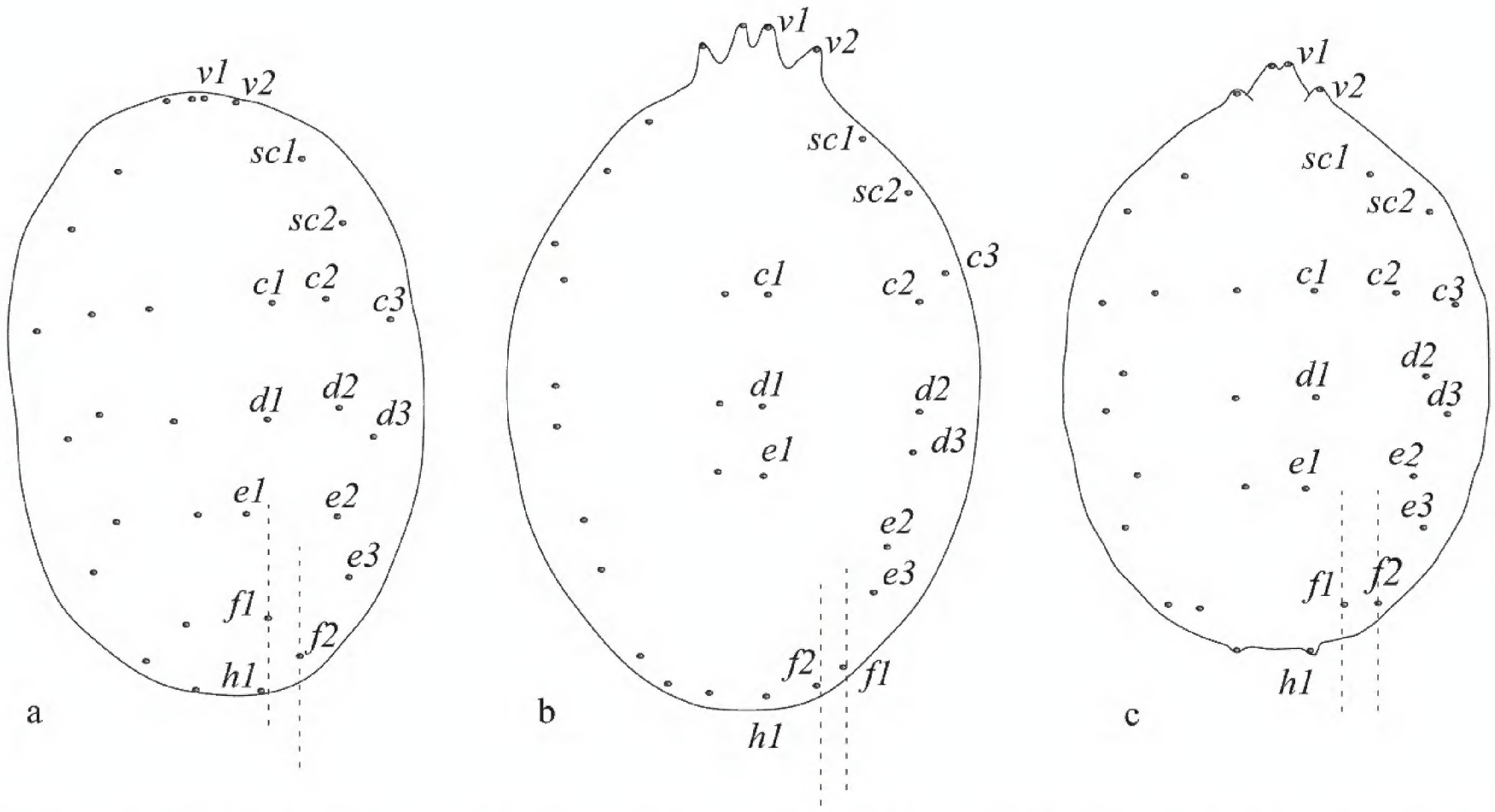

Figure 2. Position of setae f_1 and relative distances of f_1–f_1 vs f_2–f_2 (shown by dashed line) **a** setae f_1 present centrally in *Bryobia* (*Allobia*) *abbatielloi* (Smiley & Baker, 1995) (redrawn from Smiley and Baker 1995) **b** setae f_1 present laterally in *Bryobia* (*Allobia*) *pritchardi* Rimando, 1962 (redrawn from Rimando 1962) **c** setae f_1 present sub laterally in *Bryobia* (*Bryobia*) *artemisiae* Bagdasarian, 1951 (redrawn from Livschits and Mitrofanov 1971).

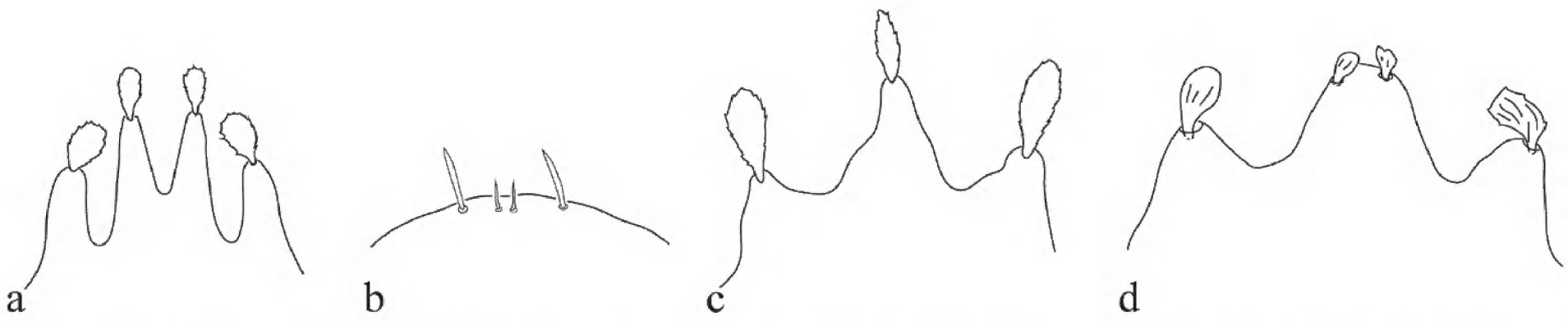

Figure 3. Development of propodosomal lobes **a** well developed in *Bryobia* (*Bryobia*) *praetiosa* Koch, 1836 (redrawn from Livschits and Mitrofanov 1971) **b** absent in *Bryobia* (*Allobia*) *abbatielloi* (Smiley & Baker, 1995) (redrawn from Smiley and Baker 1995) **c** three lobes with median lobes fused in *Bryobia* (*Bryobia*) *bakeri* (Zaher, Gomaa & El-Enany, 1982) (redrawn from Zaher et al. 1982) **d** three lobes in which median lobe is weakly developed in *Bryobia* (*Allobia*) *geyeri* Meyer, 1974 (redrawn from Meyer 1974).

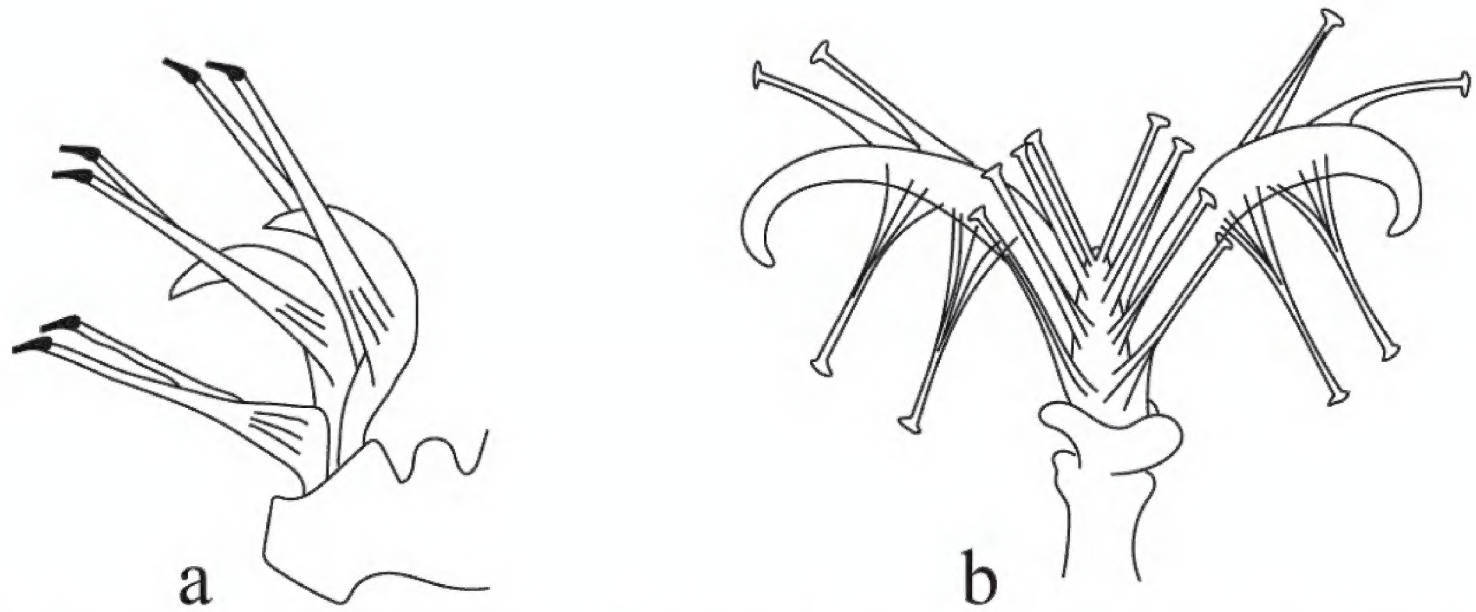

Figure 4. Number of tenent hairs on leg I empodium **a** one pair of tenent hairs in *Bryobia* (*Bryobia*) *strunkovae* Mitrofanov, 1968 (redrawn from Mitrofanov 1968) **b** more than one pair of tenent hairs in *Bryobia* (*Bryobia*) *borealis* Oudemans, 1930 (redrawn from Mathys 1962).

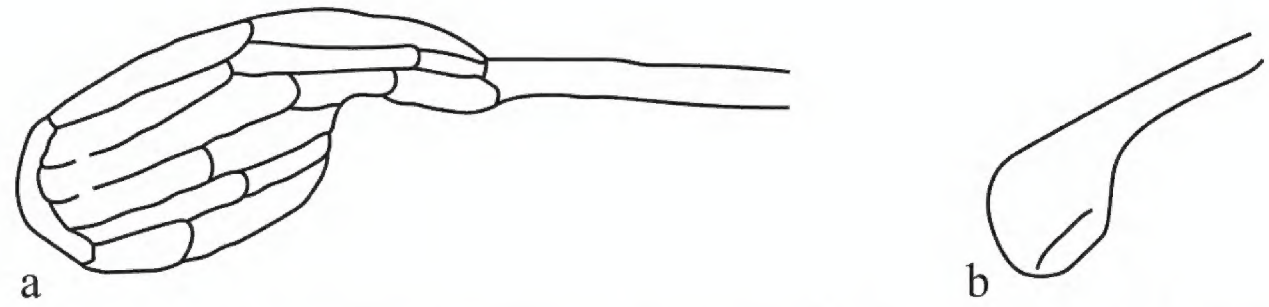

Figure 5. Shape of peritremes **a** enlarged, anastomose in *Bryobia* (*Allobia*) *marcandrei* Hatzinikolis & Panou, 1996 (redrawn from Hatzinikolis and Panou 1996) **b** simple bulb in *Bryobia* (*Allobia*) *birivularis* Meyer, 1989 (redrawn from Meyer and Ueckermann 1989).

Notes on the species of the subgenus *Allobia*

The subgenus *Allobia* includes 28 species (Mirza et al. 2024) although only 22 valid species are included in the key above. Among the remaining six species, five species described by Meyer (1974, 1987) have pad-like true claws on leg I. Mirza et al. (2024) provided a detailed discussion on how this character state contradicts the diagnosis of the Bryobiini tribe. In the present study, the sixth species *B*. (*A*.) *orycustodia* Meyer (in Meyer & Ueckermann, 1989) from the species group *pritchardi* is also considered among those five species of Meyer in which leg I true claws are also pad-like. These six species were not added to the diagnostic key for the time being as this requires an update of the diagnoses of all tribes of subfamily Bryobiinae based on the shape of leg I true claws.

Species group *abbatielloi*

There are only two species existing in the species group *abbatielloi*, *B.* (*A*.) *abatielloi* (Smiley & Baker, 1995) and *B.* (*A*.) *querci* Hatzinikolis & Panou, 1997 (Mirza et al. 2024). The species *B.* (*A*.) *querci* was distinguished by the presence of f_2 setae in line with other dorsocentral setae c_1, d_1, and e_1 (Hatzinikolis and Panou 1997). This position of seta f_2 is incorrectly described in this species, based on the nomenclature of Lindquist (1985). Hence, the seta f_2 (outer sacral) described by Hatzinikolis and Panou (1997) is actually seta f_1 (inner sacral) and vice versa.

Subgenus *Bryobia* s. str. Koch, 1836

Type species. *Bryobia praetiosa* Koch, 1836: 8.

Diagnosis (based on females). As defined by Mirza et al. (2024).

Key to the 43 species of the subgenus *Bryobia*

Species groups definition is based on Mirza et al. 2024

1 Fourth pair of dorsocentral setae f_1 present centrally, aligned with another 3 pairs of dorsocentral setae *neoephedrae* species group..... ..... ***B.* (*B.*) *neoephedrae* (Gutierrez & Bolland, 1998)**

– Fourth pair of dorsocentral setae f_1 present sublaterally where the distance f_1-f_1 is shorter than f_2-f_2 *osterloffi* species group.....**2**

– Fourth pair of dorsocentral setae f_1 present laterally, along the margin and the distance f_1-f_1 always greater than f_2-f_2 *praetiosa* species group **8**

2 Femur IV with ≥ 5 setae **4**
– Femur IV with ≤ 5 setae..... **3**
3 Genu II with 5 setae..... ***B.* (*B.*) *artemisiae* Bagdasarian, 1951**
– Genu II with 3 setae.....
..... ***B.* (*B.*) *serifiotica* Hatzinikolis, Papadoulis & Kapaxidi, 2007**
4 Femur IV with 7 setae ..... ***B.* (*B.*) *abyssiniae* Fashing & Ueckermann, 2016**
– Femur IV with 5 setae **5**
5 Femur III with 4 or 5 setae **6**
– Femur III with 6 or 7 setae **7**
6 Genu II with 8 setae..... ***B.* (*B.*) *petrilunara* Meyer, 1987**
– Genu II with 5 or 6 setae ..... ***B.* (*B.*) *burkei* Meyer, 1987**
7 Genu IV with 6 setae ..... ***B.* (*B.*) *osterloffi* Reck, 1947**
– Genu IV with 4 or 5 setae..... ***B.* (*B.*) *variabilis* Manson, 1967**
8 Propodosoma with 7 setae ... ***B.* (*B.*) *bakeri* (Zaher, Gomaa & El-Enany, 1982)**
– Propodosoma with 8 setae..... **9**
9 Femur IV with 2 or 3 setae..... **10**
– Femur IV with > 3 setae **13**
10 Genu I with 8 setae..... ***B.* (*B.*) *meteoritica* Hatzinikolis & Panou, 1996**
– Genu I with 4 setae..... **11**
11 Femur II with 6 setae..... ***B.* (*B.*) *reckiana* Mitrofanov & Strunkova, 1968**
– Femur II with 5 setae..... **12**
12 Genu III with 3 setae..... ***B.* (*B.*) *montana* Mitrofanov, 1973**
..... ***B.* (*B.*) *nitrariae* He & Tan, 1993**
– Genu III with 2 setae.... ***B.* (*B.*) *tadjikistanica* Livschits & Mitrofanov, 1968**
13 Femur IV with 6 setae **14**
– Femur IV with < 6 setae..... **17**
14 Genu II with 6 setae..... **16**
– Genu II with 4 or 5 setae **15**
15 Femur I with 18 setae; genu I with 6 setae .....
..... ***B.* (*B.*) *xiningensis* Ma & Yuan, 1981**
– Femur I with ≥ 20 setae; genu I with > 6 setae ..... ***B.* (*B.*) *vasiljevi* Reck, 1953**
16 Dorsal integument densely granulates without striae .....
..... ***B.* (*B.*) *agioriticus* Hatzinikolis & Emmanouel, 1996**
– Propodosoma with irregular discontinuous fine striae, hysterosoma mostly transverse with irregular fine striae medially .....
..... ***B.* (*B.*) *alberensis* Auger & Migeon, 2023 (in Auger et al. 2023)**
17 Genu II with 7 or 8 setae **38**
– Genu II with < 7 setae..... **18**
18 Femur I with ≥ 14 setae..... **21**
– Femur I with ≤ 13 setae..... **19**
19 Empodium I with a pair of tenant hairs..... **20**
– Empodium I with > 1 pair of tenant hairs; dorsocentral setae c_1 and d_1 crossing basis of next setae..... ***B.* (*B.*) *hengduanensis* Wang & Cui, 1991**
20 Tibiae I and II with 11 or 12 and 9 setae, respectively .....
..... ***B.* (*B.*) *strunkovae* Mitrofanov, 1968**
– Tibiae I and II with 16 and 8 setae, respectively.....
..... ***B.* (*B.*) *ziziphorae* Strunkova & Mitrofanov, 1983**
21 Tibia I with ≥ 21 setae ..... ***B.* (*B.*) *macrotibialis* Mathys, 1962**
– Tibia I with ≤ 20 setae **22**

22 Dorsal setae c_2 and c_3 are in the same horizontal line **27**
– Dorsal setae c_2 and c_3 distinctly not in the same horizontal line **23**
23 Tarsi III and IV each with 13 setae ..... ***B.* (*B.*) *gigas* Auger, Arabuli & Migeon, 2014**
– Tarsi III and IV each with > 13 setae **24**
24 Genua III and IV with 3 and 4 setae, respectively ..... ***B.* (*B.*) *qilianensis* Ma & Yuan, 1981**
– Genua III and IV each with 6 setae **25**
25 Femora III and IV each with 4 or 5 setae **26**
– Femora III and IV with 7 and 5 setae, respectively ..... ***B.* (*B.*) *latisetae* Wang, 1985**
26 Femora III and IV each with 4 setae ..... ***B.* (*B.*) *exserta* Wang, 1985**
– Femora III and IV each with 5 setae ..... ***B.* (*B.*) *graminum* (Schrank, 1781)**
***B.* (*B.*) *monticola* Wang, 1985**
27 Genua I and II with 4 and 3 setae, respectively **28**
– Genu I with 7 or 8 setae, genu II with 5 or 6 setae **29**
28 Stylophore anteriorly rounded, true claws of leg II-IV with 2 rows of tenent hairs ..... ***B.* (*B.*) *magallanica* Gonzalez, 1977**
– Stylophore anteriorly slightly notched, true claws of leg II-IV with 4–8 tenent hairs ..... ***B.* (*B.*) *glacialis* Berlese, 1913**
29 Tibia I with 12–16 setae **32**
– Tibia I with 17–20 setae **30**
30 Tarsus I with 20 setae **31**
– Tarsi I and II with 31 and 19 setae respectively ..... ***B.* (*B.*) *qinghaiensis* Ma & Yuan, 1981**
31 Femur I with 23 setae; tarsus II with 15 setae ..... ***B.* (*B.*) *cyclamenae* Hatzinikolis & Panou, 1996**
– Femur I with 19 setae; tarsus II with 18 setae ..... ***B.* (*B.*) *platani* Hatzinikolis & Panou, 1997**
32 Empodium I with 2 rows of tenant hairs .... ***B.* (*B.*) *borealis* Oudemans, 1930**
– Empodium I with a pair of tenant hairs **33**
33 Dorsal body setae palmate (Fig. 6a); femur IV with 4 setae; tarsus IV with 14 setae ..... ***B.* (*B.*) *fuegina* Gonzalez, 1977**
– Dorsal body setae not as above **34**
34 Propodosoma without lateral projection; tarsal claws II-IV each with > 1 pair of tenant hairs **35**
– Propodosoma with lateral projection **36**
35 Tarsus I with a pair of tenent hairs ..... ***B.* (*B.*) *cagani* Çobanoğlu, Ueckermann & Cilbircioğlu, 2021**
– Tarsus I with > 1 pair of tenent hairs ..... ***B.* (*B.*) *urticae* Sayed, 1946**
36 Stylophore rounded ..... ***B.* (*B.*) *praetiosa* Koch, 1836** ..... ***B.* (*B.*) *kissophila* Eyndhoven, 1955**
– Stylophore notched **37**
37 Tibia I with 14–16 setae; femur II with ≥ 10 setae ..... ***B.* (*B.*) *watersi* Manson, 1967**
– Tibia I with 13 setae; femur II with 8 setae ..... ***B.* (*B.*) *attica* Hatzinikolis & Emmanouel, 1990**
38 Genu II with 7 setae ..... ***B.* (*B.*) *emmanoueli* Hatzinikolis & Panou, 1996**
– Genu II with 8 setae ..... ***B.* (*B.*) *nikitensis* Livschits & Mitrofanov, 1969**

Notes on the species of the subgenus *Bryobia*

The subgenus *Bryobia* includes 53 species (Mirza et al. 2024), although only 43 species are included in the key above. Among the remaining ten, two species belong to the species group *praetiosa*, *B. geigeriae* Meyer, 1974, and *B. karooensis* Meyer, 1974, which are excluded from the key due to ambiguity in the leg I true claw morphology as debated by Mirza et al. (2024). The two species *B.* (*B.*) *calida* Karg, 1985 and *B.* (*B.*) *lagodechiana* Reck, 1953 could not be assigned to any species group due to insufficient information available on the position of the inner sacral seta f_1. The status of the remaining six species excluded from the above key is discussed below.

Species group *praetiosa*

The species *B.* (*B.*) *montana* Mitrofanov, 1973 was originally described from Tadjikistan on the host plant *Astragalus* sp., while the species *B.* (*B.*) *nitrariae* He & Tan, 1993 was reported from China on the host plant *Nitraria sibirica*. These two species are similar in all morphological characters, including leg chaetotaxy. The only difference is in the number of setae on tarsus I for both species, 20 vs 18, respectively. The descriptions of both species provided leg setal counts as the total number, including sensory and tactile setae. It is important to note that He and Tan (1993) differentiated *B.* (*B.*) *nitrariae* from *B.* (*B.*) *tadjikistanica* Livschits & Mitrofanov, 1968, which is also morphologically close to *B.* (*B.*) *montana*. The two species, *B.* (*B.*) *tadjikistanica* and *B.* (*B.*) *montana*, share the same type locality, Tadjikistan. There are also minor differences between *B.* (*B.*) *nitrariae* and *B.* (*B.*) *tadjikistanica* in the shape of their spermathecae and true claws. The two species *B.* (*B.*) *montana* and *B.* (*B.*) *nitrariae* key out near each other. Examining the type specimens would help to clarify their statuses.

The three species, *B.* (*B.*) *graminum* (Schrank, 1781), *B.* (*B.*) *monticola* Wang, 1985, and *B.* (*B.*) *neopraetiosa* Meyer, 1974 are also morphologically close. They have been reported from Germany (on Poaceae sp.), China (on Poaceae sp.), and South Africa (on multiple hosts), respectively. The leg chaetotaxy for *B.* (*B.*) *neopraetiosa* is neither described nor illustrated in detail (except for femur I, genua I and II, and tibia I), while that of *B.* (*B.*) *graminum* and *B.* (*B.*) *monticola* has few variations on leg tarsal segments. Based on the available descriptions, re-descriptions, and illustrations, it could be suggested that *B.* (*B.*) *monticola* and *B.* (*B.*) *neopraetiosa* should be synonymized with *B.* (*B.*) *graminum*. Similarly, the species *B.* (*B.*) *exserta* Wang, 1985 was reported from China on *Artemisia* sp. and was distinguished from *B.* (*B.*) *praetiosa* Koch, 1836 based on minor morphological variations, including body length, propodosomal lobe lengths, leg genu I segment comparative lengths. *Bryobia* (*B.*) *exserta* also morphologically resembles the three species discussed above. It is impossible to decide the synonymy of *B.* (*B.*) *exserta*, whether it should be synonymized with *B.* (*B.*) *graminum* or *B.* (*B.*) *praetiosa*. The species *B.* (*B.*) *praetiosa* is the type species of the genus *Bryobia*, while *B.* (*B.*) *graminum*, one of the oldest species described, was moved to the genus *Bryobia* by Oudemans (1929). Mitrofanov et al. (1987) synonymized *B.* (*B.*) *praetiosa* with *B.* (*B.*) *graminum*, but previously, Pritchard and Baker (1955) considered synonymizing *B.* (*B.*) *praetiosa* with *B.* (*B.*) *graminum* and suggested further detailed studies. However, these two species still remain valid (Migeon and Dorkeld 2025).

Two species, *B*. (*B*.) *qinghaiensis* Ma & Yuan, 1981 and *B*. (*B*.) *yunnanensis* Ma & Yuan, 1981, are described from China, from the Palearctic and Oriental regions, respectively. They are morphologically similar to each other, apart from some setal variations on leg tarsal and tibial segments, and were differentiated from *B*. (*B*.) *praetiosa* and *B*. (*B*.) *qinghaiensis*, respectively, based on a few minor differences. These species resemble *B*. (*B*.) *praetiosa*, the type of the genus. Note that the concept of a *praetiosa* species complex still exists, and there are a considerable numbers of populations described under the name of *praetiosa*, or otherwise, from different localities of the world. Each of those descriptions and illustrations provided various degrees of chaetotaxies and body measurements, which further complicate the true identification of *B*. (*B*.) *praetiosa*. Pritchard and Baker (1955) provided an excellent debate on the overall situation of the *praetiosa* complex. It appears that this complex and its synonyms will continue to grow.

The species *B*. (*B*.) *batrae* Baker & Tuttle, 1994 was described from the USA, occurring on the host plant *Stellaria media*. This species cannot be added to the key as it was very briefly described and illustrated. Baker and Tuttle (1994) also did not compare it with any related species. The species *B*. (*B*.) *japonica* Ehara & Yamada, 1968, also cannot be included as it was also very briefly described. The authors did compare it with *B*. (*B*.) *sarothamni* and *B*. (*B*.) *tadjikistanica* based on the absence of dorsal lobes. These two species belong to the subgenus *Allobia* (*Bryobia*) (Mirza et al. 2024).

Tuttle and Baker (1976) described *B*. (*B*.) *neoribis* with a duplex on both leg tarsi III and IV. However, their 1994 original description of the species on *Acer negundo* from Utah, USA stated an absence of duplex on leg tarsus IV. Based on the current designations, the latter species/population belongs to the subgenus *Lyobia* (*Bryobia*). The authors further stated that this species was similar to the European *B*. (*B*.) *ribis* Thomas, 1896. The latter is poorly described and has been suggested as a synonym of *B*. (*B*.) *praetiosa* (Pritchard and Baker 1955). This population of *B*. (*B*.) *neoribis* should be reidentified based on type material examination to reach a valid species designation.

The two species, *B*. (*B*.) *neoribis* sensu Tuttle and Baker (1976) and *B*. (*B*.) *ribis* are morphologically close. Mathys (1957) provided detailed morphological analysis and bioecological aspects of the species *B*. (*B*.) *ribis* and other *Bryobia* species found in the French part of Switzerland. The species *B*. (*B*.) *neoribis* was differentiated from *B*. (*B*.) *ribis* based on the number of setae on the femur I (24 vs 16) and variations in body and setal lengths. Tuttle and Baker (1976) did not provide a comprehensive description of the species, preventing detailed comparison and validation with other *Bryobia* species. Similarly, there is no detailed description and illustration of *B*. (*B*.) *ribis*. Mathys (1957) stated that complementary morphological differences could be found in the larval stage of *B*. (*B*.) *ribis*. This raises doubts over the validity of *B*. (*B*.) *neoribis* as only the female stage was briefly described. It would require a comprehensive set of specimens from the type locality to validate the status of the *B*. (*B*.) *neoribis*. For the time being, both species are excluded from the diagnostic key.

The species *B*. (*B*.) *xizangensis* Wang, 1985 was described from China from an unknown host plant. This species was originally differentiated from *B*. (*L*.) *longisetis* Reck, 1947 and was described with one or two pairs of tenent hairs on leg empodium I. Based on the findings of the present study, this species could be morphologically close to *B*. (*B*.) *hengduanensis* Wang & Cui, 1991

due to one pair of tenent hairs present on empodium I, but differentiated based on the length of dorsal body hairs, short vs long, crossing the bases of setae next in line, respectively. Considering the two pairs of tenent hairs on empodium I, *B*. (*B*.) *xizangensis* is similar to *B*. (*B*.) *ziziphorae* Strunkova & Mitrofanov, 1983, but is easily differentiated based on the development of propodosomal lobes, strongly developed and deep incision between the inner and outer lobes vs. weakly developed with small lobes, respectively.

Subgenus *Lyobia* Livschits & Mitrofanov, 1971

Type species. *Bryobia rubrioculus* (Scheuten) 1857: 104.

Diagnosis (based on females)**.** As defined by Mirza et al. (2024).

Key to the 51 species of the genus *Lyobia*

Species groups definition is based on Mirza et al. 2024.

1 Dorsocentral setae f_1 present centrally, aligned with dorsocentral setae c_1 *eurotiae* species group **3**

– Dorsocentral setae f_1 present laterally or sublaterally **2**

2 Dorsocentral setae f_1 present sublaterally, distance f_1-f_1 shorter than f_2-f_2 *sarothamni* species group **4**

– Dorsocentral setae f_1 present laterally, distance f_1-f_1 longer than f_2-f_2 *rubrioculus* species group **10**

3 Dorsal body setae sit on distinct tubercles; tibia II with 6 tactile setae..... ..... ***B*. (*L*.) *pamirica* Mitrofanov, 1973**

– Dorsal body setae sit on indistinct tubercles; tibia II with 9 tactile setae.... ..... ***B*. (*L*.) *eurotiae* Mitrofanov, 1973**

4 Leg empodium I with 1 pair of tenent hairs..... ..... ***B*. (*L*.) *chrysocomae* Meyer, 1974**

– Leg empodium I with > 1 pair of tenent hairs **5**

5 Dorsocentral setae longer than the distance to bases of setae next in line... **6**

– Dorsocentral setae distinctly shorter than the distance to bases of setae next in line **7**

6 Palp of tarsus distinctly longer than tibial claw palp ....***B*. (*L*.) *perinsignis* Eyndhoven & Vacante, 1985**

– Palp of tarsus equal to tibial claw palp..... .....***B*. (*L*.) *nasrvasensis* Bagdasarian, 1960**

7 Stylophore rounded anteriorly **8**

– Stylophore emarginate anteriorly **9**

8 Dorsal body setae lanceolate, broad distally..... .....***B*. (*L*.) *sarothamni* Geijskes, 1939**

– Dorsal body setae slender ..... ***B*. (*L*.) *annatensis* Manson, 1967**

9 Palptibial claw bidentate..... .....***B*. (*L*.) *polymorpha* Auger & Migeon, 2023 (in Auger et al. 2023)**

– Palptibial claw simple ..... ***B*. (*L*.) *spica* Pritchard & Keifer, 1958**

10 Propodosoma with reticulation pattern **11**

– Propodosoma without reticulation pattern..... **14**

11 Dorsal body setae fan-shaped (Fig. 6b) or spatulate or subspatulate (Fig. 6c) **12**

– Dorsal body setae palmate; opisthosoma with 7 large oval dimple-like depressions with rounded reticulations ..... ***B*. (*L*.) *alveolata* Auger & Flechtmann, 2009**

12 Opisthosoma with 3 pairs of oval depressions **13**

– Opisthosoma without oval depressions; empodium I with 2 rows of tenent hairs ..... ***B*. (*L*.) *dianthi* Mitrofanov & Sharonov, 1983**

13 Propodosoma with 2 large oval lateral depressions; empodium I with 3 pairs of tenent hairs ..... ***B*. (*L*.) *hadizeni* Barbar, Parker & Auger, 2022**

– Propodosoma without oval depressions; empodium I with 1 pair of tenent hairs ..... ***B*. (*L*.) *mercantourensis* Auger & Migeon, 2014**

14 Most of dorsal body setae spatulate **15**

– Dorsal body setae not as above **38**

15 Empodium I with 1 pair of tenent hairs **16**

– Empodium I with ≥ 1 pairs of tenent hairs **25**

16 Dorsocentral setae c_1 and d_1 elongate crossing half distance between next setae or reaching basis of next setae **17**

– Dorsocentral setae c_1 and d_1 short not crossing half distance between next setae **18**

17 First and second pairs of propodosomal setae v_1 and v_2 equal in length; c_1 and d_1 reaching or almost reaching bases of next setae ..... ***B*. (*L*.) *dubinini* Bagdasarian, 1960**

– First pair of propodosomal setae v_1 distinctly shorter than second pair v_2; c_1 and d_1 reaching half distance between next setae ..... ***B*. (*L*.) *longisetis* Reck, 1947**

18 Stylophore notched **19**

– Stylophore rounded **23**

19 Second and fourth pairs of propodosomal setae v_2 and sc_2 spatulate ... **20**

– Second and fourth pairs of propodosomal setae v_2 and sc_2 palmate; tibia I with 15 setae ..... ***B*. (*L*.) *kassioticus* Hatzinikolis & Panou, 1997**

20 Area posterior seta e_1 with U-shaped striation; propodosoma granulate with irregular longitudinal striae ..... ***B*. (*L*.) *siliquae* Hatzinikolis & Emmanouel, 1991**

– Area posterior setae e_1 with irregular or transverse striae, not U-shaped ... **21**

21 Second pair of propodosomal lobes well developed **22**

– Second pair of propodosomal lobes absent or poorly developed; femur II with 10 setae ..... ***B*. (*L*.) *syriensis* Barbar & Auger, 2020**

22 Median propodosomal lobes well developed ..... ***B*. (*L*.) *baroni* Auger, Arabuli & Migeon, 2022**

– Median propodosomal lobes weakly developed or fused ..... ***B*. (*L*.) *populi* Wang & Zang, 1984**

23 Femur II with 12 setae..... ***B*. (*L*.) *cerasi* Hatzinikolis & Emmanouel, 1991**

– Femur II with < 12 setae **24**

24 Dorsum granulate with irregular striae; femur II with 9 setae ..... ***B*. (*L*.) *dikmenensis* Eyndhoven & Vacante, 1985**

– Dorsum granulate without striae; femur II with 8 setae ..... ***B*. (*L*.) *piliensis* Hatzinikolis & Emmanouel, 1996**

25 Median propodosomal lobes expanded and slightly overlapping; stylophore rounded ..... ***B.* (*L.*) *berlesei* Eyndhoven, 1957**
– Median propodosomal lobes not overlapping..... **26**
26 First and second pairs of propodosomal setae v_1 and v_2 are equal in length **35**
– First pair of propodosomal setae v_1 shorter than second pair v_2..... **27**
27 Setae c_3 in line with setae c_1 and c_2..... **28**
– Setae c_3 not in line with setae c_1 and c_2 ..... **31**
28 Tibia I with 9 setae; genua I and II each with 4 setae ..... ***B.* (*L.*) *nothofagi* Gonzalez, 1977**
– Tibia I with 12 setae or more; genua I and II each with ≥ 4 setae **29**
29 Tibia I with 2 sensory setae..... **30**
– Tibia I with 3 sensory setae; femora II and III with 8 and 5 setae, respectively ..... ***B.* (*L.*) *mirmoayedii* Khanjani, Gotoh & Kitashima, 2008**
30 Femora II and III with 10 and 7 setae, respectively ..... ***B.* (*L.*) *cooremani* Eyndhoven & Vacante,**
– Femora II and III with 7 and 4 setae, respectively ..... ***B.* (*L.*) *vaneyndhoveni* Vacante, 1983**
31 Setae c_3 below setae c_2..... ***B.* (*L.*) *eharai* Pritchard & Keifer, 1958**
– Setae c_3 above setae c_2..... **32**
32 Tarsus I with 8 sensory setae..... **33**
– Tarsus I with 7 sensory setae; genu I with 6 setae **34**
33 Femora I and IV with 13–15 and 4 or 5 setae, respectively..... ***B.* (*L.*) *cavalloroi* Vacante & Eyndhoven, 1986**
– Femora I and IV with 10–12 and 6 setae, respectively ..... ***B.* (*L.*) *ulicis* Eyndhoven, 1959**
34 Dorsum integument granulate with irregular striae ..... ***B.* (*L.*) *pyrenaica* Eyndhoven & Vacante, 1985**
– Dorsum integument granulated..... ***B.* (*L.*) *strombolii* Vacante, 1983**
35 Setae c_3 located above setae c_2 ..... **36**
– Setae c_3 located below setae c_2; empodia I with 2 pairs of tenent hairs ..... ***B.* (*L.*) *chongqingensis* Ma & Yuan, 1981**
36 Genu I with 7 or 8 setae; femora II and III with 9 and 7 setae, respectively. ..... ***B.* (*L.*) *aetnensis* Vacante, 1983**
– Genu I with < 6 setae..... **37**
37 Genu I with 6 setae; femur III with 6 setae..... ***B.* (*L.*) *dekocki* Eyndhoven & Vacante, 1985**
– Genu I with 4 or 5 setae; femur III with 7 setae ..... ***B.* (*L.*) *vandaelei* Vacante, 1983**
38 Dorsal body setae palmate or fan-shaped..... **39**
– Dorsal body setae lanceolate or slender **46**
39 Peritremes with simple bulb distally **40**
– Peritremes anastomose distally..... **42**
40 Dorsal body setae palmate; empodium I with 1 pair of tenent hairs ..... ***B.* (*L.*) *convolvulus* Tuttle & Baker, 1964**
– Dorsal body setae fan-shaped..... **41**
41 Empodium I with 1 pair of tenent hairs..... ***B.* (*L.*) *oblonga* Livschits & Mitrofanov, 1968**
– Empodium I with ≥ 1 pairs of tenent hairs..... ***B.* (*L.*) *kakuliana* Reck, 1956**

42 Dorsocentral setae c_1-c_1, d_1-d_1, e_1-e_1 very close to each other ..... ***B.* (*L.*) *angustisetis* Jakobashvili, 1958**

– Dorsocentral setae c_1-c_1, d_1-d_1, e_1-e_1 widely spaced **43**

43 Femur I with 23 setae; tibia I with 14 setae .. ***B.* (*L.*) *parietariae* Reck, 1947**

– Femur I with not more than 21 setae **44**

44 Tibia I with 12 setae ..... ***B.* (*L.*) *centaureae* Livschits & Mitrofanov, 1972**

– Tibia I with 15–16 setae **45**

45 Femur II with 9 setae ..... ***B.* (*L.*) *rubrioculus* (Scheuten, 1857)**

– Femur II with 11 setae ..... ***B.* (*L.*) *tiliae* (Oudemans, 1928)**

46 Dorsal setae lanceolate (Fig. 6d) **47**

– Dorsal setae slender, long at least reaching (Fig. 6e), empodium I with 2 rows of tenent hairs ..... ***B.* (*L.*) *cinereae* Auger & Migeon, 2014**

47 Tibiae III-IV each with 9 setae **48**

– Tibiae III-IV each with < 9 setae; femur I with 12 setae or fewer **49**

48 Femur I with 20 or 22 setae ..... ***B.* (*L.*) *gushariensis* Livschits & Mitrofanov, 1972**

– Femur I with 13 or 18 setae ..... ***B.* (*L.*) *obihsaphedi* Mitrofanov, 1968**

49 Femur I with 12 setae; tibiae III-IV each 7 setae ..... ***B.* (*L.*) *livschitzi* Mitrofanov & Strunkova, 1968**

– Femur I with 8 or 9 setae; tibiae III-IV each with < 7 setae **50**

50 Setae on femora I-IV 9–7–5–3; tibiae III-IV each with 4 setae ..... ***B.* (*L.*) *astragali* Strunkova & Mitrofanov, 1983**

– Setae on femora I-IV 8–7–4–2; tibiae III-IV with 3 and 5 setae, respectively ..... ***B.* (*L.*) *bucharica* Strunkova & Mitrofanov, 1983**

Notes on the species of the subgenus *Lyobia*

The subgenus *Lyobia* includes 58 species (Mirza et al. 2024) but the key to only 51 species is provided above. The species *B.* (*L.*) *ericoides* Meyer, 1974, belonging to the species group *eurotiae*, is excluded from the key due to leg I true claw morphology. The status of the remaining six species, all belonging to the species group *rubrioculus*, are discussed below.

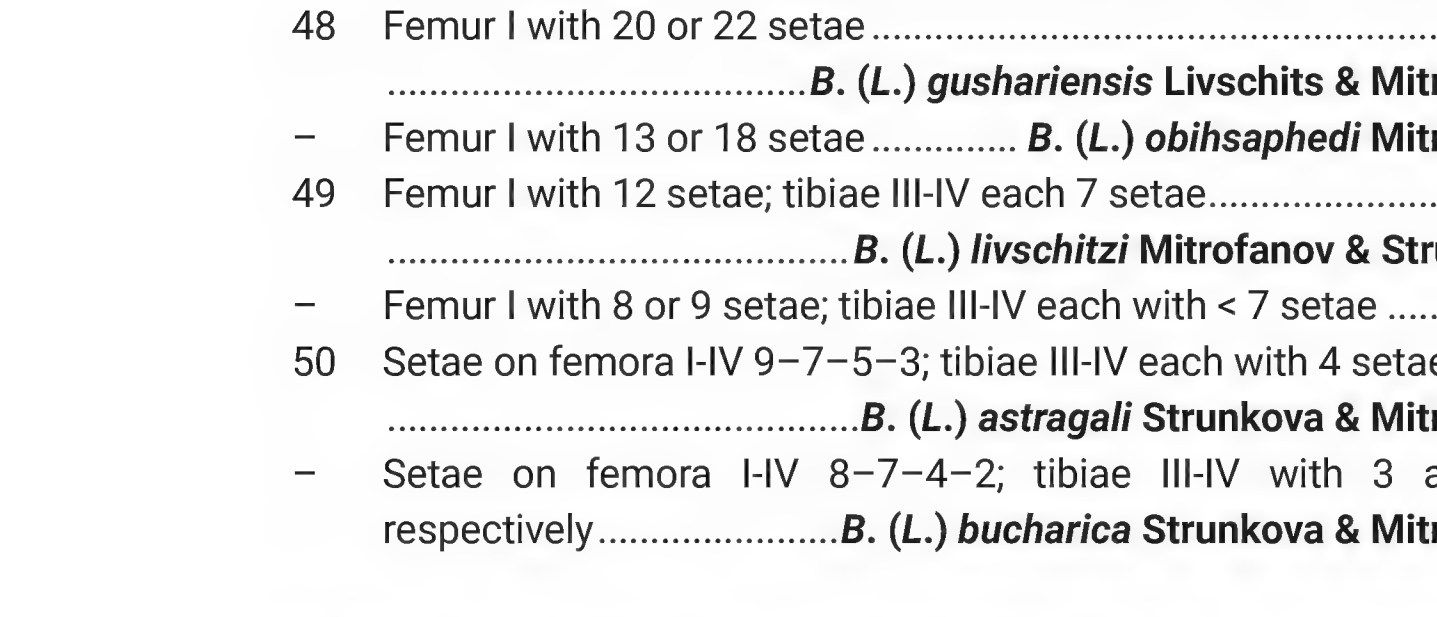

Figure 6. Shape of dorsal setae in adult female **a** palmate in *Bryobia* (*Lyobia*) *alveolata* Auger & Flechtmann, 2009 (redrawn from Auger et al. 2009) **b** fan-shaped in *Bryobia* (*Lyobia*) *kakuliana* Reck, 1956 (redrawn from Livschitz and Mitrofanov 1971) **c** spatulate in *Bryobia* (*Allobia*) *birivularis* Meyer, 1989 (redrawn from Meyer and Ueckermann 1989) **d** lanceolate in *Bryobia* (*Lyobia*) *gushariensis* Livschits & Mitrofanov, 1971 (redrawn from Livschits and Mitrofanov 1971) **e** setiform serrate in *Bryobia* (*Lyobia*) *cinereae* Auger & Migeon, 2014 (redrawn from Auger and Migeon 2014).

Species group *eurotiae*

The two species in this species group *B*. (*L*.) *eurotiae* Mitrofanov, 1973 and *B*. (*L*.) *pamirica* Mitrofanov, 1973, are morphologically similar and share the type host plant (*Eurotia* sp.), type locality (Tadjikistan), and date of collection (23 July 1967). These two species share most morphological characteristics, including similar body length and width, lacking propodosomal lateral lobes, setae v_2 longer than v_1, slender setiform setae, length of leg I equal to body length, number of tenant hairs on leg empodia I-IV, and most of the leg chaetotaxy. The morphological characters which differentiate *B*. (*L*.) *eurotiae* from *B*. (*L*.) *pamirica* include state of propodosomal lobes (completely absent vs inner lobes joined from the middle, forming a cone), dorsal setal tubercles (indistinct vs distinct), leg chaetotaxy of femora I-III (9-7-4 vs 8-6-3), genua I and II (8-5 vs 4-4), and tibia II (9 vs 6), respectively. The differences in leg chaetotaxy mentioned above should be re-examined and could be considered as variations. The original description of *B*. (*L*.) *eurotiae* provides leg chaetotaxy in which tibia I has 24 setae. It appears that the setal count of tibia I was missed, and the setal counts for tarsus I were provided. It could be assumed that there are 24 setae on tarsus I, which was also described for *B*. (*L*.) *pamirica* because the chaetotaxy of tibiae II-IV is similar in both species. Similarly, the setae f_1 were described to be present sublaterally in *B*. (*L*.) *pamirica*, while they are illustrated as aligned with dorsocentral setae c_1. Hence, the setae f_1 are present centrally or subcentrally in *B*. (*L*.) *pamirica*, similar to *B*. (*L*.) *eurotiae*. Although there is evidence for the possible synonymy of these two species, it is important to re-examine the type specimens to reach a definitive conclusion.

Species group *sarothamni*

There are seven species in this species group (Mirza et al. 2024). The morphology of propodosomal lobes has been described with variations. For instance, *B*. (*L*.) *sarothamni* Geijskes, 1939, was originally described from the Netherlands, with the presence of four propodosomal lobes in the form of tubercles (Geijskes 1939). Pritchard and Baker (1955) distinguished the English population of *B*. (*L*.) *sarothamni* with a complete absence of "cephalic projections". Baker and Tuttle (1994) reported the presence of the propodosomal projection, where outer ones were as broad as long, and 1/3 as long as the inner pair. This situation is similar to that in the *praetiosa* species complex (in the subgenus *Bryobia* (*B*.)). It is recommended to approach the species in this species group with extreme caution, and morphological variations should be completely understood before describing new taxa.

Species group *rubrioculus*

There are 48 species included in this species group (Mirza et al. 2024). The species *B*. (*L*.) *cinereae* Auger & Migeon, 2014 was placed in the species group *sarothamni* (Mirza et al. 2024). However, in the present study, it is included in the species group *rubrioculus* due to the marginal position of sacral f_1 and f_2 setae. This species is morphologically close to *B*. (*L*.) *belliloci* Auger, Arabuli & Migeon, 2015; however, the morphological differences are debatable. It has been stated that setae d_1 clearly surpass the bases of e_1 in *B*. (*L*.) *belliloci* (illustrated as just passing) while setae d_1

just reach the base of setae e_1 in *B*. (*L*.) *cinereae* (Auger and Migeon 2014). There are other morphological characters which were used to differentiate *B*. (*L*.) *belliloci* from *B*. (*L*.) *cinereae* including the depth of the inner lobe incisions (but illustrated as exactly same for both species), peritremal distal enlargement length (both anastomosing but length has 7 µm difference), length of internal seta l'_1 on femur I, lengths and shapes of coxal setae *1b* and *1c* (discrepancies in the description and illustrations of *B*. (*L*.) *belliloci*). These characters may reflect variations in the morphologies, especially when both species have the same host plant, *Genista cinerae*, and are both reported from France (Auger and Migeon 2014; Auger et al. 2015). The species *B*. (*L*.) *belliloci* is excluded from the key, and perhaps further studies may suggest it as a junior synonym of *B*. (*L*.) *cinereae*.

The four species *B*. (*L*.) *tiliae* (Oudemans, 1928; Germany), *B*. (*L*.) *rubrioculus* (Scheuten, 1857; Germany), *B*. (*L*.) *lonicerae* Reck, 1956 (Georgia), and *B* (*L*.) *ulmophila* Reck, 1947 (Georgia), are very similar to each other in all morphological aspects including leg morphology. The species *B*. (*L*.) *rubrioculus* has been described and illustrated from different regions of the world and number of species have been synonymized under it (Migeon and Dorkeld 2025). Frommer and Jorgensen (1972) studied the morphological and behavioral variations with host specificity of *B*. (*L*.) *rubrioculus* and distinctly separated this species from *B*. (*L*.) *praetiosa*. The two species *B*. (*L*.) *lonicereae* and *B*. (*L*.) *ulmophila* were morphologically compared with *B*. (*L*.) *redikorzevi* that is considered a synonym of *B*. (*L*.) *rubrioculus* by Frommer and Jorgenson (1972). Wainstein (1960) considered *B*. (*L*.) *ulmophila* as synonym of *B*. (*L*.) *redikorzevi*. The species *B*. (*L*.) *tiliae* was originally described as a type species of the genus *Schmiedleinia* Oudemans, 1928, based on the larval specimens collected from the host plant *Tiliae* sp. in Germany (Oudemans 1928). The genus was later synonymized with the genus *Bryobia*, and the species *tiliae* was considered as the larvae of *B*. *praetiosa* (Oudemans 1930). Bagdasarian (1957) described the species *B*. (*L*.) *tiliae* from Armenia on the same host plant, *Tiliae* sp. It was later considered a synonym of the species described by Oudemans (1928) (Wainstein 1960). In that synonymy, *B*. (*L*.) *tiliae* was considered to be morphologically close to *B*. (*L*.) *ulmophila* and *B*. (*L*.) *redikorzevi* (Bagdasarian 1957) but distinguished based on the number of setae on leg femur I. Both of the latter two species have been considered as a synonym of *B*. (*L*.) *rubrioculus*. The leg chaetotaxy alone would not be sufficient to confidently validate the identity of the species. In light of this debate, it would be difficult to reach any definitive conclusion regarding the validity of these three species, and their synonymy with *B*. (*L*.) *rubrioculus* requires further investigation.

Eyndhoven and Vacante (1985) described 13 species belonging to the *berlesei* species group, eight of which were described for the first time. Among them, five species *B*. (*L*.) *pandayi* Eyndhoven & Vacante, 1985, *B*. (*L*.) *pyrenaica* Eyndhoven & Vacante, 1985, *B*. (*L*.) *pelerentsi* Eyndhoven & Vacante, 1985, *B*. (*L*.) *dikmenensis* Eyndhoven & Vacante, 1985, and *B*. (*L*.) *provincialis* Eyndhoven & Vacante, 1985, have variable morphological characters. The three species *B*. (*L*.) *pandayi*, *B*. (*L*.) *pyrenaica*, and *B*. (*L*.) *pelerentsi* were considered close to each to other and the differential character designated as "Each species has its own host plant" (Eyndhoven and Vacante 1985: 400). In all other morphological aspects, these three species resemble each other, and it is difficult to differentiate them. The remarks for these species were stated as "For general remarks see *Bryobia pandayi*". It is important to mention that a species having its own host plant does not

necessitate its validity. The species *B*. (*L*.) *pandayi* was reported from *Calicotome spinosa*. The same host plant (*Calicotome* sp.) harbors almost seven *Bryobia* taxa (Migeon and Dorkeld 2025). Interestingly, *B*. (*L*.) *pelerentsi* is also reported from *Calicotome* sp. (Eyndhoven and Vacante 1985). Hence, with this argument, the synonymy of *B*. (*L*.) *pyrenaica* and *B*. (*L*.) *pelerentsi* with *B*. (*L*.) *pandayi* appears undeniable. Similarly, both species, *B*. (*L*.) *dikmenensis* and *B*. (*L*.) *provincialis* are reported from the same host plant (*Genistus* sp.) and were morphologically designated close to each other by Eyndhoven and Vacante (1985). The only morphological difference described was that the second and third dorsocentrals were smaller than the other dorsal body setae in *B*. (*L*.) *dikmenensis*, while of similar length in *B*. (*L*.) *provincialis*. However, this contradicts what has been described for these setae based on 14 specimens (Eyndhoven and Vacante 1985). This places the status of these species as doubtful, and there is an urgent need for re-analysis of the morphological characters of these species.

Conclusions

In conclusion, the present study provides a comprehensive taxonomic status of the species of *Bryobia* through detailed literature-based morphological analysis. The diagnostic keys to the majority of *Bryobia* species will undoubtedly prove useful for acarologists. The taxonomic notes on some species and the variability in morphological characters found among different populations of a species deepen our understanding of morphological diversity in the genus. It is important to note that there are four species: *B. apsheronica* Khalilova, 1953, *B. desertorum* Hassan, Afifi & Nawar, 1986, *B. ribis* Thomas, 1896, and *B. weyerensis* Packard, 1889 that are not included in any subgenus or species group due to inadequate and insufficient literature, as also reported by Mirza et al. (2024). The species *B. weyerensis* may not even belong to the family Tetranychidae, while the former three species should be redescribed. Although some species have been suggested to be synonymized with closely related species, a valid taxonomic and systematic decision should be backed and supported by careful examination of the type specimens. In the scenario where types have been lost, a collection should be initiated to revisit the type locality.

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Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

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Data availability

All of the data that support the findings of this study are available in the main text.

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